Introduction of Hybrid Electric Vehicles

Department of Energy - USA

Ministry of Science & Technology

PRC

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Outline

- Hybrid Vehicle Technology in US
- Current Program Emphasis - Supporting Technology
- Standards for Hybrid Vehicles
- Hybrid Vehicle Development
- Commercialization of Hybrid Vehicles

Hybrid Vehicle Technology Development in US

- Current program began in 1992
- Hybrids are the major thrust of the Partnership for a New Generation of Vehicles
- Initial and continuing emphasis is on improved fuel economy
- New emissions control regulations have a significant effect on hybrid technology

Hybrid Vehicle Technology Development - 2

- Initial emphasis was on systems programs
- Development contracts were with major US automotive manufacturers:
  - Chrysler (now DaimlerChrysler)
  - Ford
  - General Motors
- Development Proprietary
- Limited Public Reports Provided

Current Program Emphasis Supporting Technology

- Accessory Load Reduction
- Advanced Materials
- Energy Conversion
- Energy Management
- Fuels Technology
- Power Electronics & Electric Machines

Accessory Load Reduction

- Advanced Glazing;
  - Reflects Heat
  - Reduced Conductive Losses
- Advanced Insulation
- Thermal Comfort Modeling
- Heated & Cooled Seats

Energy Conversion

- Advanced Heat Engines:
  - Compression Ignition Direct Injection (Diesel)
  - Spark Ignition Direct Injection
- Fuel Cell Technology:
  - Improved Fuel Cell Stacks
  - Fuel Reformer Technology
  - System Integration

Energy Management

- High Power Batteries
  - Nickel Metal Hydride
  - Lithium Ion
  - Lithium Polymer

[This work is conducted by the United States Advanced Battery Consortium]

Advanced Fuels Technology

- Advanced petroleum based fuel (successor to current diesel fuels)
- Ethanol (from biomass)
- Hydrogen

Power Electronics & Electric Machines

- Inverters:
  - Power Electronic Building Blocks
  - Advanced Topologies and Components
- Improved Motors and Generators

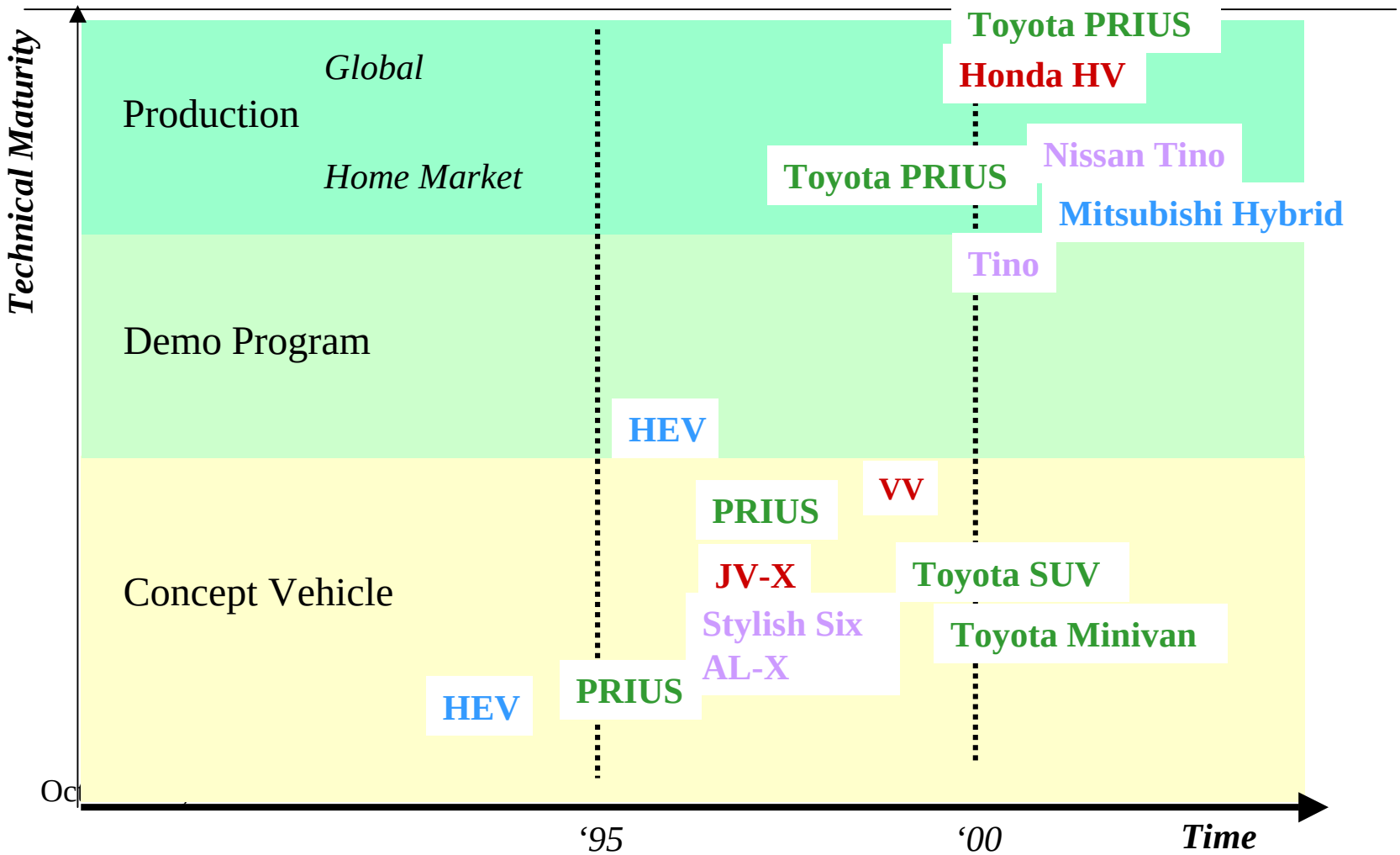
Advanced Materials

- Metals
- Ceramics
- Composites

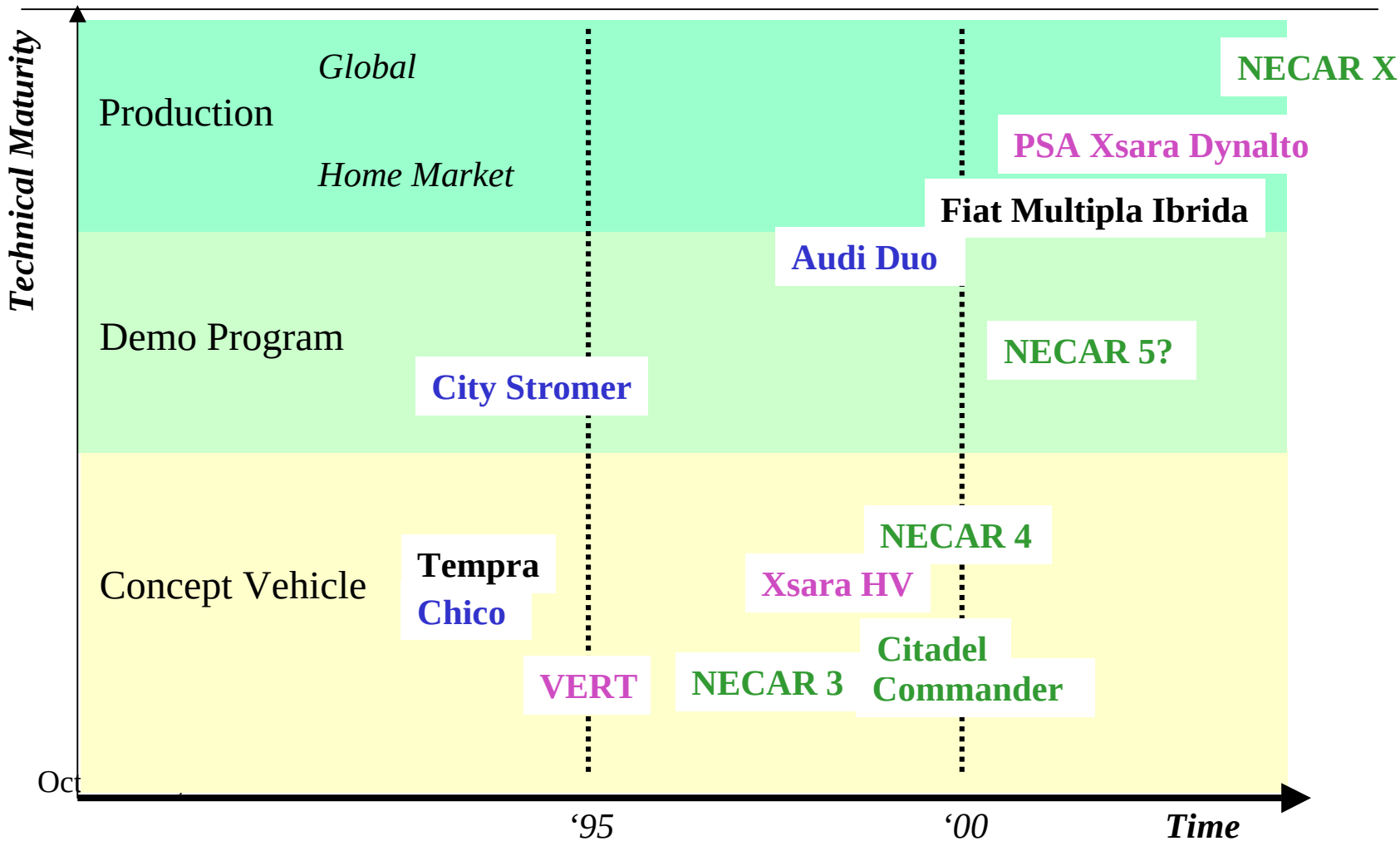
Standards for Hybrid Vehicles

- SAE J 1711 - Hybrid Electric Vehicle Emissions and Energy Consumption Test
- Most other SAE standards for electric vehicles also effectively apply to hybrid electric vehicles.

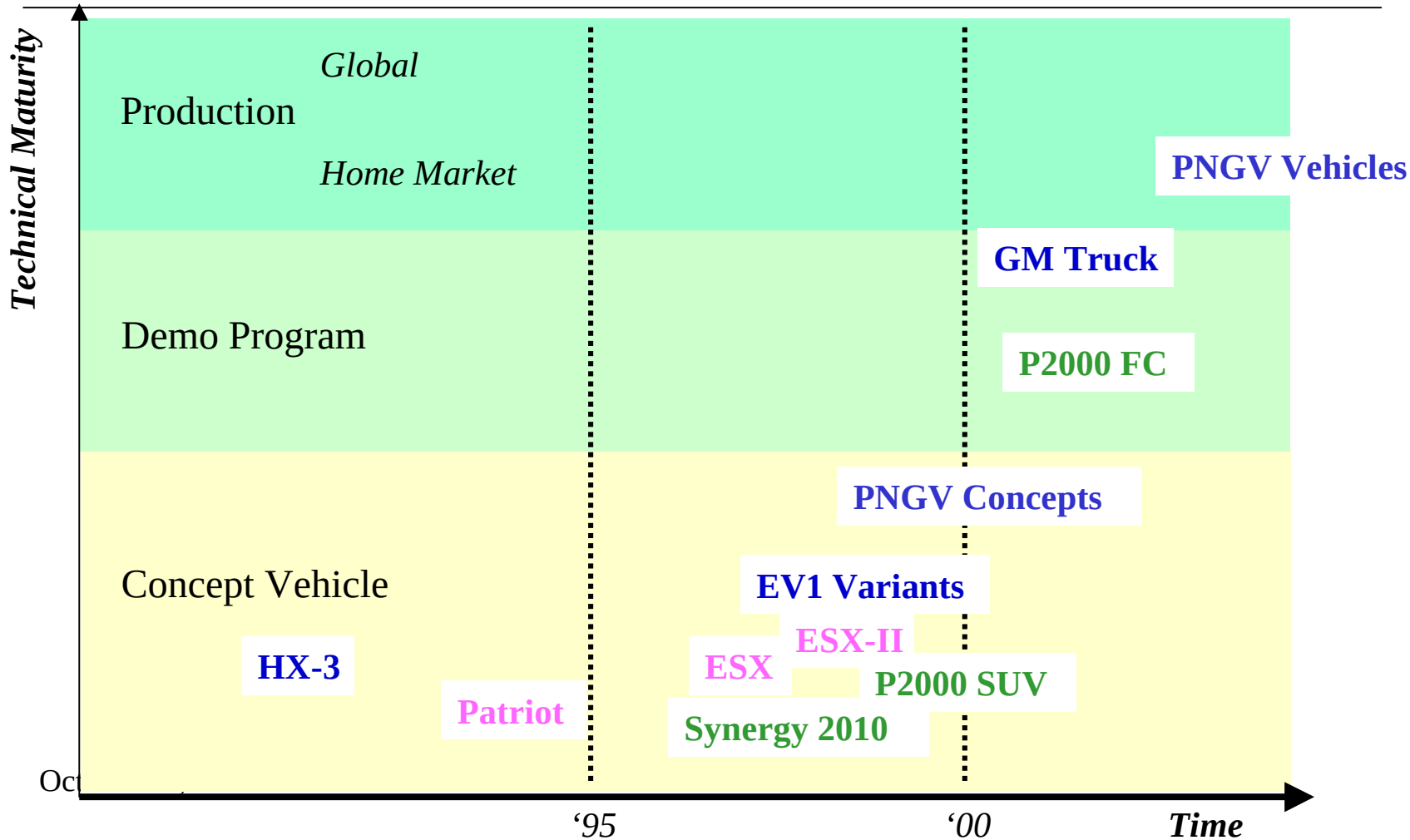
Hybrid Vehicle Development - Asia (Japan)



Hybrid Vehicle Development - Europe



Hybrid Vehicle Development- US



Commercialization of Hybrid Vehicles

- Commercialization of Hybrid Vehicles may or may not be driven by market conditions
- The most important external factor is fuel price (including taxes)
- Policy measures may be appropriate to encourage purchase and use of hybrid vehicles

Proposed US Hybrid Tax Credit

Tax Credit	Increase in Fuel Efficiency	Purchase Date
$ 1,000	1-1/3 X	12/31/02 – 1/1/05
$ 2,000	1-2/3 X	12/31/02 – 1/1/07
$ 3,000	2X	12/31/03 – 1/1/07
$ 4,000	3X	12/31/03 – 1/1/07

Additional Information Needs

- MoST should define additional information and other needs